

DEFINITION OF TERMS

ULTRASOUND

Acoustic impedance – resistance of sound as it propagates through the medium

Acoustic window – ability of sonography to visualize a particular area. The full urinary bladder is a good acoustic window to image the uterus and ovaries in trans-abdominal sonogram. The intercostal margins may be a good acoustic window to image the liver parenchyma.

Anechoic – property of being free of echoes or with out echoes

Angle of incidence – angle at which the ultrasound beam strikes an interface with respect to normal (perpendicular) incidence

Ankle/Brachial Index (ABI) – ratio of ankle pressure to brachial pressure to provide a general guide to help determine the degree of disability of lower extremity.

Attenuation – weakening of the sound wave as it propagates through a medium

Axial resolution – ability to distinguish two structures along a path parallel to the sound beam

Biparietal diameter (BPD) – largest dimension of the fetal head perpendicular to the midsagittal plane; measured by ultrasonic visualization and used to measure fetal development

Color flow Doppler – velocity in each direction is quantified by allocating a pixel to each area; each velocity frequency change is allocated a color.

Complex – containing anechoic and echogenic areas.

Continuous wave ultrasound – wave in which cycles repeat indefinitely; consist of a separate transmit and receiver transducer housed within one assembly.

Coronal image plane – anatomic term used to describe a plane perpendicular to the sagittal and transverse plane of the body.

Detail resolution – includes axial and lateral resolution

Doppler Effect – shift in frequency or wavelength, depending on the conditions of observation; caused by relative motions among sources, receivers and medium.

Doppler ultrasound – application of Doppler Effect to ultrasound to detect movement of reflecting boundary relative to the source, resulting in a change of the wavelength of the reflected wave

Duplex imaging – combination of gray-scale real-time imaging and color or spectral Doppler

Echo – reflection of acoustic energy received from scattering elements or a specular reflector.

Echogenic – refers to a medium that contains echo-producing structures.

Embryo – term used for developing zygote through the 10th week of gestation.

Endometrium – inner layer of uterine canal

Endorectal transducer – high frequency transducer that can be inserted into the rectum and visualize the bladder and prostate gland.

Endovaginal transducer – high frequency transducer (and decreased penetration) that can be inserted into the vagina to obtain high resolution images of the pelvic structures.

False pelvis – region above the pelvic brim

Fetus – term used for the developing embryo from the 11th gestational week until birth.

Follicular cyst – functional or physiologic ovulatory cyst consisting of an ovum surrounded by a layer of cells

Frequency – number of cycles per unit, usually expressed in Hertz (Hz) or megahertz (MHz) a million cycles per seconds

Gestational age – length of time calculated from the first day of the last menstrual period; also known as gestational weeks

Gestational sac – fluid filled structure normally found in the uterus containing the pregnancy

Gray scale – range of amplitude (brightness) between black and white

Heterogeneous – having a mixed composition

Homogeneous – having a uniform composition

Hyperechoic – producing more echoes than normal

Hypoechoic – producing less echoes than normal

Intima – inner layer of the vessel; the middle layer is the media and the outer layer is the adventitia.

Iliopectineal line – bony ridge on the inner surface of ileum and pubic bones that divides the true and false pelvis

Ischemia – area of the cardiac myocardium that has been damaged by disruption of the blood supply by the coronary artery

Isoechoic – having a texture nearly as same as that of the surrounding parenchyma.

Lateral resolution – ability to distinguish two structures lying perpendicular to the sound beam.

Leiomyoma – most common benign tumor of the uterine myometrium

Myometrium – thick layer of the uterine wall

Non-invasive technique – procedure that does not require the skin to be broken or an organ or cavity to be entered

Oblique plane – slanting direction or any variation that is not starting at a right angle to any axis

Parenchyma – functional tissue or cells of an organ or gland

Piezoelectric effect – conversion of pressure to electrical voltage or conversion of electrical voltage to mechanical pressure

Phasic flow – normal venous respiratory variations

Porta hepatitis – region in hepatic hilum containing common duct, proper hepatic artery and main portal vein

Posterior acoustic enhancement – increase in reflection amplitude from structures that lie behind a weakly attenuating structure.

Posterior acoustic shadowing – reduction in reflection amplitude from reflectors lying behind a strongly reflecting or attenuating structure.

Pulse wave ultrasound – a transducer emits short pulses of ultrasound into the human body and receives reflection from the body before emitting another pulse of sound.

Real-time imaging – imaging with rapid frame rate visualizing moving structures or scan planes continuously

Reflection – redirection (return) of a portion of the sound beam back to the transducer

Refraction – phenomenon of bending wave fronts as the acoustic energy propagates from the medium of one acoustic velocity

Regurgitation – occurs when blood leaks from one high pressure chamber to a chamber of lower pressure

Resolution – measure the ability to display two closely spaced structures as discrete targets

Retroperitoneal cavity – area posterior to the peritoneal cavity that contains the aorta, inferior vena cava, pancreas, part of the duodenum and colon, kidneys and adrenal glands.

Retrouterine pouch – pelvic space located anterior to the rectum and posterior to the uterus; also known as **pouch of Douglas**

Sagittal – plane that travels **vertically** from the top to the bottom of the body along the y axis

Scattering – diffusion or redirection of sound in several directions encountering a particle suspension or rough surface

Sonar (sound navigation and ranging) – instrument used to discover **objects underwater and to show their location**

Sound wave – longitudinal waves of mechanical energy propagated through a medium

Transducer/Probe – device that **converts energy from one form to another**.

Transverse – plane that passes through the width of the body in a **horizontal direction**

Ultrasound – sound with a **frequency greater than 20 kHz (audible sound – 20 kHz below)**

Velocity of sound – speed with direction of motion specified

HISTORICAL DEVELOPMENT

1940's – Howry, Wild and Ludwig independently showed that when ultrasound waves generated by a piezoelectric crystal transducer were transmitted into the human body, these waves would be returned to the transducer from tissue interfaces of **different acoustic impedances**.

1947 – Dussick positioned two transducers on opposite sides of the head to measure ultrasound transmission profiles.

1948 – Howry developed the **first ultrasound scanner**, consisting of cattle watering tank with a wooden rail anchored along the side.

1954 – Hertz and Edler developed **echocardiographic techniques**

1957 – Brown and Donald built early **obstetric contact compound scanner**